

NON-PUBLIC?: N
ACCESSION #: 9009130189
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Trojan Nuclear Plant PAGE: 1 OF 05

DOCKET NUMBER: 05000344

TITLE: Incorrect Feedwater Pump Protective Instrument Adjustment Leads to Pump Trip Followed by Reactor Trip and Auxiliary Feedwater Actuation

EVENT DATE: 08/09/90 LER #: 90-034-00 REPORT DATE: 09/10/90

OTHER FACILITIES INVOLVED: NA DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:

NAME: E. W. Ford, Compliance Engineer TELEPHONE: (503) 556-5577

COMPONENT FAILURE DESCRIPTION:

CAUSE: NA SYSTEM: COMPONENT: MANUFACTURER:

REPORTABLE NPRDS:

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On August 9, 1990, the Trojan Nuclear Plant was operating in Mode 1 (Power Operation) at 100 percent Rated Thermal Power. The generator load was approximately 1135 MW. At 1648 the "B" Feedwater Pump tripped on indication of high thrust bearing wear. In response to the loss of the Feedwater Pump, the Main Turbine began an automatic runback and the control rods began automatically stepping in to reduce Reactor power. The turbine runback continued for one minute, twenty seconds; then the Reactor automatically tripped on low-low level in the "D" steam generator. Following the Reactor trip, automatic Feedwater Isolation and Auxiliary Feedwater initiation occurred. The "B" Feedwater Pump trip was initiated by protective instrumentation which received indication of excessive thrust bearing wear in the pump's turbine driver. The excessive bearing wear indication was the result of incorrectly set instrumentation, not actual wear. The thrust bearing wear indicating

instruments were recalibrated and the pump was reassembled. The plant was returned to power operation on August 11, 1990. This event had no effect upon public health and safety. The Reactor Protective System and Engineered Safety Features Actuation System functioned as required. The plant responded as expected to the trip.

END OF ABSTRACT

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EVENT DESCRIPTION

On August 9, 1990, the Trojan Nuclear Plant was operating in Mode 1 (Power Operation) at 100 percent Rated Thermal Power. The Reactor Coolant System pressure and average temperature were 2235 psig and 584 degrees F, respectively. The generator load was approximately 1135 MW. No special testing or surveillance was in progress. At 1648 the "B" Feedwater Pump tripped on indication of high thrust bearing wear. In response to the loss of the Feedwater Pump, the Main Turbine began an automatic runback and the control rods began automatically stepping in to reduce Reactor power. The steam dump valves opened in response to the steam pressure increase which resulted from the turbine load reduction, but the plant operators manually closed them in an attempt to maintain a balance between feedwater flow and steam flow. The turbine runback continued for approximately one minute, twenty seconds; then the Reactor automatically tripped because of low-low level in the "D" steam generator. The generator load at the time of the trip was between 600 and 650 MW. Following the Reactor trip, automatic Feedwater Isolation and Auxiliary Feedwater initiation occurred. The four Main Steam Power Operated Relief Valves, and four Main Steam Safety Valves opened to control secondary plant pressure since the steam dump valves were closed. The minimum Reactor Coolant system pressure and average temperature experienced during the transient were 1880 psig and 546 degrees F, respectively.

The Reactor trip was an automatic Reactor Protection System actuation. The Auxiliary Feedwater initiation was an automatic Engineered Safety Features actuation. These actuations are reportable under the requirements of 10 CFR 50.73 (a)(2)(iv). This report is submitted to fulfill those requirements. This event was also reported via the Emergency Notification System, on August 9, 1990, in accordance with the requirements of 10 CFR 50.72.

CAUSE

The Reactor trip and Auxiliary Feedwater initiation were caused by

low-low level in the "D" steam generator which resulted from the steam flow/feedwater flow mismatch following the trip of the "B" Feedwater Pump.

The Feedwater isolation occurred due to the Reactor trip and coincident low average Reactor Coolant System temperature.

The "B" Feedwater Pump trip was initiated by protective instrumentation which received indication of excessive thrust bearing wear in the pump's turbine driver. The excessive bearing

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wear indication was the result of incorrectly set instrumentation, not actual bearing wear. This was confirmed by inspection of the bearings following the plant trip.

The instrumentation was incorrectly set because it had been adjusted earlier in the month to compensate for unexpected indication of high thrust in the negative (i.e. inactive) direction as the Feedwater Pump load varied with plant output and feedwater demand. Several instances of alarms on thrust bearing wear had occurred. Prior to making adjustments to the thrust bearing wear indicating instruments, the turbine manufacturer's service representative was contacted. The service representative indicated that at 100 percent power the thrust should always be in the positive (i.e. active) direction and that the negative thrust indication could be the result of a bound coupling or a flow restriction within the turbine. The service representative also indicated that increasing the alarm and trip setpoints to obtain additional margin should cause no problems.

As a result of alarms received during the previous afternoon, a decision to readjust the zero on the thrust bearing wear detectors was made. Plant output was being reduced, to approximately 70 percent Rated Thermal Power, on August 5, 1990, in preparation for adjusting the thrust bearing wear detection instrumentation. As the plant passed through 82 percent Rated Thermal Power, thrust indication in the "A" Feedwater Pump turbine made a step change from -17 mils to -7 mils. No similar change occurred on the "B" Feedwater Pump. Although this change could not be explained, the power reduction continued to approximately 70 percent Rated Thermal Power and instrument adjustments were made on both Feedwater Pumps. Additionally, a controller problem was corrected on the "B" Feedwater Pump which had been controlled in manual. The plant was returned to 100 percent Rated Thermal Power with both Feedwater Pumps operating in automatic and an indicated thrust of approximately +3 mils, as expected.

Subsequent review of the step change of thrust indication on the "A" Feedwater Pump indicated a need to lift the thrust indication trips until a sufficient explanation could be obtained. The safety evaluation had been prepared for this temporary modification, and was being reviewed when the plant trip occurred.

Since the time of the plant trip, it has been determined that there was miscommunication between the turbine manufacturer's service representative and Portland General Electric Personnel. The service representative was under the impression that the turbines were operating at full rated output when told the plant was operating at 100 percent Rated Thermal Power. In actuality, the

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turbines operate between one-third and one-half of their rated output when the plant is operating at 100 percent Rated Thermal Power. The service representative's indication that the turbine thrust should always be in the positive direction was based upon his impression that the turbine was operating at full rated output.

Following the plant trip, the pump turbine vendor was contacted and informed of the circumstances which led to the Feedwater Pump trip (i.e. high indication of thrust in the negative direction, readjustment of the instrumentation, and the pump trip on high thrust in the positive direction). The vendor indicated that the thrust could actually reverse at a point between one-third and one-half of the turbine's rated output. Since this is the operating range of the Trojan Feedwater Pump turbines when the plant is operating near 100 Percent Rated Thermal Power, the indication of thrust in the negative direction shown by the protective instrumentation was correct and was a normal condition for operation of these turbines. Adjustment of the instruments on August 5, 1990 was unnecessary, and was determined to be cause of the Feedwater Pump trip experienced on August 9, 1990.

CORRECTIVE ACTIONS

The "B" Feedwater Pump and turbine thrust bearings were disassembled and inspected on August 10, 1990. There were no indications of excessive thrust or wear found. The coupling between the turbine and pump was also disassembled and inspected. It was also found to be installed correctly. Since no problems were found on the "B" Feedwater Pump, the "A" Feedwater Pump and thrust bearings were not disassembled.

The thrust bearing wear indicating instruments were recalibrated and the plant was returned to power operation on August 11, 1990.

The circumstances involved in this event were discussed with management personnel during regularly scheduled management meetings. The need to communicate effectively when discussing equipment operation problems with vendors, and not proceeding when unexpected events occur (e.g. step change in indicated thrust on August 5, 1990) were stressed. This was also discussed with the specific individuals involved.

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SAFETY SIGNIFICANCE

This event had no effect upon public health and safety. The Reactor Protective System and Engineered Safety Features Actuation System functioned as required to shut down the Reactor and supply Auxiliary Feedwater upon receipt of the low-low level signal from the "D" steam generator instrumentation. The plant responded as expected to the trip.

PREVIOUS SIMILAR EVENTS

A review of Licensee Event Reports associated with Reactor trips since 1985 was conducted. There were no trips identified which resulted from similar circumstances. Therefore, this event is considered to be an isolated occurrence.

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PGE

Portland General Electric Company
Trojan Nuclear Plant
71760 Columbia River Hwy.
Rainier, Oregon 97048
(503) 556-3713 WRR-087-90
September 10, 1990

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington DC 20555

Gentlemen:

Licensee Event Report No. 90-34 is attached. This report discusses an event in which a Reactor trip and Auxiliary Feedwater actuation occurred following a trip of one Feedwater Pump.

Sincerely,

W. R. Robinson
General Manager
Trojan Nuclear Plant

c: Mr. John B. Martin
Regional Administrator, Region V
U.S. Nuclear Regulatory Commission

Mr. David Stewart-Smith
State of Oregon
Department of Energy

Mr. R. C. Barr
USNRC Resident Inspector
Trojan Nuclear Plant

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